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GEOGRAPHICAL READERS

EDITED BY F. W. RUDLER, F.G.S.

STANDARD II.

PHYSICAL GEOGRAPHY

BY

W. J. STEWART, B.A.

EXETER COLLEGE, OXFORD

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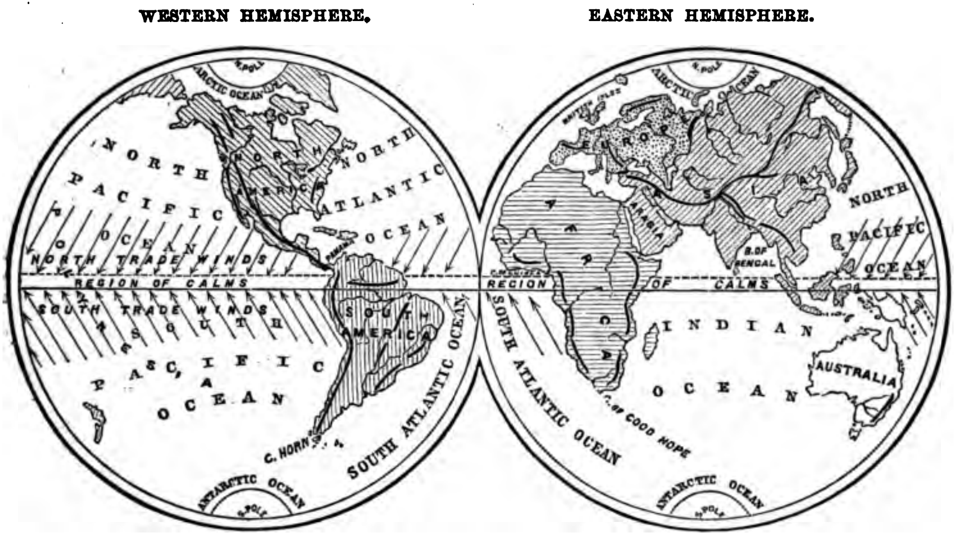
PREFACE.

THESE LESSONS have been prepared with the view of presenting the elementary facts of Physical Geography in a form suited to the comprehension of young children. Special care has therefore been taken to employ the simplest possible language; yet it is believed that this simplicity of treatment has in no sense been attended with any sacrifice of accuracy.

In writing and arranging the Lessons, Mr. STEWART has primarily kept in view the requirements of Mr. Mundella's New Code, under which Geography forms a class-subject which is to be taught, in part, by means of reading-books. It is required that in Standard II. the child shall possess a knowledge of the size and shape of the world, the meaning of ordinary geographical terms, and the physical geography of hills and rivers. It is hoped that the careful reading of this book will contribute to satisfactory results under the *merit* clause.

The Editor desires to acknowledge the valuable assistance which he has received, in the revision of these Lessons by Mr. T. PARRY, F.R.G.S., whose long experience in teaching has given him ample means of knowing the difficulties which young children usually experience in making their first acquaintance with Geography.



WESTERN HEMISPHERE.

EASTERN HEMISPHERE.

The Diameter of the Earth (that is, the measurement *through* its centre) is about 8,000 miles.
The Circumference of the Earth (that is, the measurement *round* it) is about 25,000 miles.

GEOGRAPHICAL READER.

STANDARD II.

LESSON I.

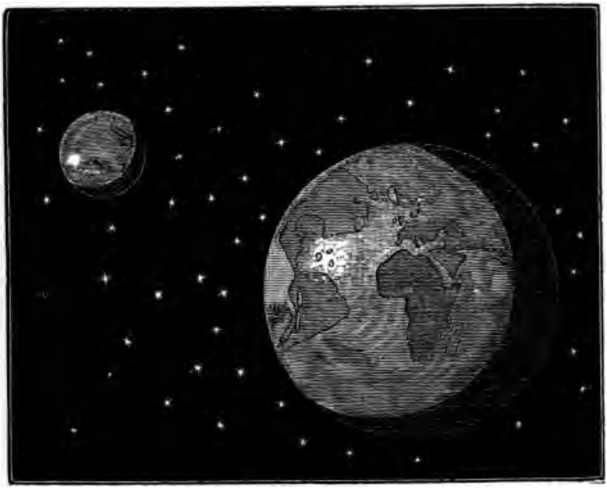
THE SHAPE OF THE EARTH.

thought
floor
wrong
learnt
school-room
curved
curv-ing
sur-face
sphere
hid-den
tow-ards
view
spread
ap-pear
no-tice
slight-ly

The Earth is round, like a ball.—It is not an easy thing to find out the true shape of the earth on which we live. Men thought, in very early times, that, if there were no hills, the earth would form a great flat plain, like the floor of the school-room, only very much larger. But they were quite wrong in this view. Many ages ago clever men learnt that the face of the earth is not flat, but curved or rounded.

A great part of the earth is covered by

the sea; and though the surface of this water seems to be quite flat when there are no waves, it also is curved. If we go in a ship from one part of the world to another, we travel over the rounded surface of the sea. And if we travel by land, we must also move over a surface which is slightly curved. This curving or roundness is very nearly the same in every part of the world. In fact, the shape of the earth is much like the shape of a well-made ball. The globe which stands in the school-room is of the same shape as the earth.



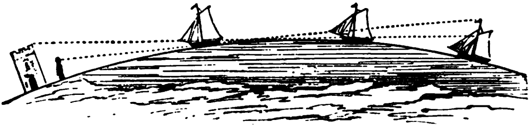
THE EARTH AND MOON IN SPACE.

A body which is round all over, like a ball, is called a *sphere*.

Proof that the Earth is round.—If we stand on the shore and look out to sea, the water is spread out before us as far as our eyes can reach; and, far off, the sea and the sky seem to meet.

SHIPS AT SEA.

If we watch a ship as she sails away from us out to sea, we are able for some time to make out her lower part or hull, her sails, her masts, and the flag flying at the mast-head. But when she gets to the place where the sea and sky appear to meet, we notice that *the ship seems to sink into* *the sea.* First the hull is lost to view, and then the lower sails sink; next the upper sails pass out of sight, and we can see nothing of the ship but the tops of her masts and her flag. At last they also sink, and no trace of the ship can then be seen. The ship has not, however, sunk into the sea; she is still sailing on, though we cannot see her from where we are standing.



ROUNDNESS OF THE EARTH.

She is hidden from us by the curved surface of the earth.

The ship goes out of sight; but after a time we hear that she is coming back. We go down to the sea-shore and watch. At last, just where the sea and sky seem to meet, we see a flag which seems to rise out of the water. Then we see the masts of a ship rising up. By-and-by we see her upper sails, next her lower sails, and lastly her hull: the whole ship is now seen sailing towards us.

If we stand at the foot of a hill, and watch some one walk over the hill, we shall see that when he gets to the top he seems to sink down into the ground. First of all we lose sight of his feet, then of his legs and body, and last of all of his head. We should not see anything like this, if he were walking on level ground.

So if the earth were flat, we should not see the ship sink or rise up, little by little, for there would be nothing to hide any part of her from us. It is the round surface of the earth between us and the ship, that hides her from our view.

LESSON II.

THE SHAPE OF THE EARTH (*continued*).

patch-es
o-ce-ans
coun-try
sup-pose
in-stead
chim-neys
be-yond
cir-cle
ho-ri-zon
val-leys
cap-tain
sail-or
cer-tain
hap-pens
pre-vents
un-til

Other proofs of the roundness of the Earth.— If we look at the globe, we see that there are large patches upon it, called *oceans*. The oceans are large tracts of water which cover a great part of the earth.

Every year very many ships sail across

these oceans from one country to another. Instead of standing on the sea-shore to watch one of these ships as it sails out of sight, suppose that we go on board.

As we sail away from land, we find that we lose sight of the sea-shore; not because it is too far off to be seen, for we still see the houses and the tall chimneys, and the hills beyond them. It is the round surface of the earth which prevents us from seeing the sea-shore. As we sail further away, this round surface of the earth hides from our sight the houses, then the tall chimneys, and then the hills beyond. So that at last we get quite out of sight of land. We see nothing but water around us, and the sky above us.

In the far distance the sky and the water seem to meet. It looks as if we could draw a circle where they join. This place where sky and water seem to meet, is called the *horizon*.

When we are on land, the horizon is the line where the land and the sky seem to meet. It is nearly always a very uneven line on land, because it follows the edges and slopes of the hills and valleys. But in some parts of the world there are level places, without any hills or valleys; and there the line of the horizon is nearly even and forms a circle, just as it does at sea.

Suppose we now turn our ship round, and return home. As we get near to land, the captain orders one of the sailors to climb up to the top of a mast. What is that for? In order that the sailor may look out for the land, and let his captain know as soon as he sees it. Presently we hear the sailor shout down and tell us that he can see land. We, who are standing on the deck of the ship, look where the sailor is pointing, but can see nothing of the land.

Why is it that we cannot see land, while the sailor at the top of the mast can see it? It is because the earth is round. The sailor, who is much higher than we are, can see over more of its curved surface than we can, and so sees land first. By-and-by we also see the land; first the tops of the hills, then the tops of the chimneys, next the roofs of the houses, and so on, until, at last, we can see down to the very shore.

Now, wherever we go on the earth, this roundness of the earth's surface prevents us from seeing things beyond a certain distance. As this happens in all places, the earth must be like a ball in shape. And so, though it is not *quite* round, we call it a globe or sphere.

LESSON III.

THE SUN.

pleas-ant
cheer-ful
com-plete
jour-ney
stead-i-ly
daz-zling
re-al-ly
be-cause
half-pen-ny
glow-ing
trav-el
hun-dred
min-utes
rail-way
fur-ther
warmth

The Sun gives us Light and Heat.—We all know how pleasant it is to be out on a bright sunny day. Everything seems cheerful, and light, and warm. On the other hand, a dark cloudy day makes everything look gloomy, and often causes us to feel cold. We prefer then to go out on a day when the sun is shining. All the light which we see, and the warmth which we feel when we go out, come from the sun.

We do not often care to look steadily at the sun, for it is so bright that our eyes cannot bear to gaze at it; and, indeed, we may hurt them very much if we try to look at the sun when it is shining brightly. But sometimes, when there is a mist or a fog, or when the sun is rising or setting, we can bear to look at it; because then it is not so dazzling.

Shape of the Sun.—When we view the sun, we notice that it is a round bright body. It does not seem to be very large. Indeed, if we hold a halfpenny, at our arm's length, between one of our eyes and the sun, and then shut the other eye, we shall find that we cannot see the sun at all. But the sun is not so small as it seems. It is really a big glowing globe, very much larger than the earth on which we live.

Size of the Earth.—We have learnt that the earth is round, and clever men have told us how large it is. It takes most of us about twenty minutes to walk one mile, but a railway train can travel one mile in one minute. If, now, a railway line could be laid down right round the earth, it would take such a train two weeks and a half to go all round the earth and come back to the place from which it started.

Size of the Sun.—Now the sun is so much larger than the earth, that if a railway train could travel round it at the rate of a mile in a minute, it would take about five years to complete the journey.

Distance of the Sun from the Earth.—But if the sun is really so very big, why does it look so small? It looks so small because it is so very far from the earth. When we watch a ship sailing away from us, we see that it looks smaller and smaller the further it goes. And in the same way the sun looks small because it is so very far off. Indeed, the sun is so far from the earth, that, if a train were able to travel to it, at the rate of a mile in a minute, it would be one hundred and seventy-five years in going there.

LESSON IV.

THE MOTIONS OF THE EARTH.

blaze
bla-zing
wheth-er
east-ern
heav-ens
move
mo-ving
spin-ning
dis-tance
e-ven-ly
ap-pear
ap-pa-rent
win-dow
hedge
hedg-es
ro-ta-tion

In our last lesson, we read about the size [illegible] the sun, and its distance from the earth. We learnt that it is really very much larger than the earth, and looks so small only because it is so very far away. You [illegible] think of the sun as a large blazing ball which lights and warms the earth. On some days, the clouds prevent us from seeing the sun itself; though we never saw a day which was without light.

Yet there is a time when we never can see the sun, however clear the sky may be; and that time we call *night*. Whether it is night time or only a cloudy day, we always find that it is darker and colder when we cannot see the sun itself.

Day and Night.—Why is it sometimes night and sometimes day? When we get out of bed on a bright clear morning, we see the sun in the eastern part of the sky. But it does not stop there all day. As we watch it, it seems to rise higher and higher in the heavens, until noon, when it reaches its highest point. In the afternoon the sun seems to move down towards the west; and at evening we see it set in the western sky. Then the sky grows dark, and we know that we shall see no more of the sun until next morning. We say that the sun rises in the morning, and sets in the evening; and when we look at it, it does seem as if it moved in the sky from east to west.

Does the Sun Rise and Set?—Many years ago, however, learned men proved that the sun does not move as it seems to do. Now, if the sun shines on us in the day and does not shine on us at night, and if it be true that the sun does not move round the earth, then what really does take place? The earth on which we live must be moving; and so it is. In fact, the earth is always spinning round like a top. But so steadily and evenly does it turn round, that we cannot feel any motion at all; and this leads us to fancy that the earth is still, and that it is the sun which must be moving.

We may see something like this when we travel in a train. If we travel *from* London, and look out of the window as the train moves along, the hedges, the gates, and the posts by the side of the line all seem to rush past us, as if they were going *to* London.

Yet we know quite well that it is we who are moving, and that they only *appear* to move. Just so with the earth and the sun. It is the earth which moves round, while the sun only appears to move. Hence we call the movement which the sun seems to make from east to west the *apparent motion* of the sun.

Rotation of the Earth.—As the apparent motion of the sun from east to west is really due to the motion of the earth, we see that the earth must be moving round from west to east.

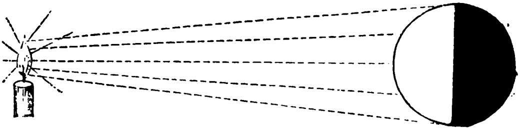
This spinning round of the earth is called its *rotation.* It is by the rotation of the earth from west to east, that every part of it is, in turn, brought into the light of the sun, and then turned away from that light into darkness. It is this rotation of the earth, therefore, which causes day and night; and as we have one day and one night every twenty-four hours, we know that the earth must turn once round in that time.

LESSON V.

THE MOTIONS OF THE EARTH (*continued*).

re-ceives
slope
slo-ping
cease
ceas-ing
re-mem-ber
move-ment
re-vo-lu-tion
car-ry
car-ri-ed
spring
sum-mer
au-tumn
win-ter
twirl
in-stead
pic-ture
length
mod-el
ax-is

WE learnt, in the last lesson, that the change from day to night and from night to day is caused by the rotation or spinning round of the earth from west to east, and that every part of the earth receives in turn the rays of the sun. The sun can shine on only half the earth at one time, that is, on that half which is turned towards it; and therefore the other half must be in darkness. When it is day here, then, it must be night on the other side of the earth; and when it is night here, it must be day there. If the earth were still, the same side of it would always be dark, and the other side would always be lit up by the sun.



LIGHT AND SHADE.

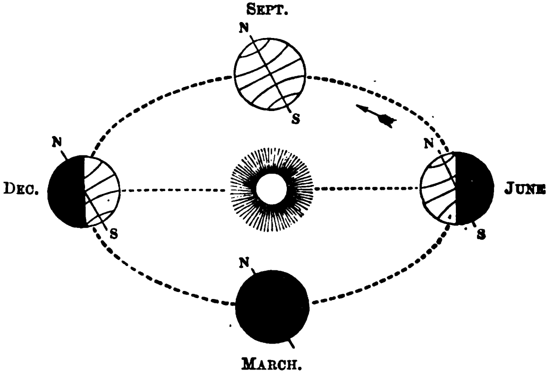
The Seasons.—Ever since we can remember, day has followed night; and none of us has ever seen a day and night of more than twenty-four hours. But in winter the days are very short, and the nights are very long. As winter passes away and spring follows, the days grow longer, and the nights grow shorter, until summer comes. Then *the days are* very long and the nights are short. As summer leaves us and autumn comes, the days begin to get short and the nights to grow long. At last, winter comes once more; and, again, we have the short days and the long nights.

Now, if the earth spun round in one spot, like a ‘sleeping’ top, the days and the nights would not vary in length, as we have just read that they do. The sun, we know, does not move round the earth; so there must be some other movement of the earth itself, besides its rotation, which makes this change in the length of day and night.

Revolution of the Earth. — This other movement which the earth has, is called its *revolution*. The earth, instead of spinning round always in the same place in the heavens, moves through the heavens and about the sun, without ceasing for a moment to spin round.

Let us try to make something to look and move like the earth. A ball will do very well for a model of the earth, and a lighted candle or lamp for the sun. If a stout wire be passed through the middle of the ball, we can twirl the ball round this *wire. The wire* on which the ball spins is called its *axis*; and we also speak of the *earth's axis*, though we know that there is no wire round which the earth rotates.

If the ball while spinning upon its axis be carried round the lighted candle, the ball will then have two motions like those of the earth. Only we must take care that the axis of the ball, instead of being upright, leans on one side, as shown in this picture.



THE SEASONS.

While the spinning ball is being carried round the candle, we must be careful to keep the axis always sloping in just the same way.

LESSON VI.

THE MOTIONS OF THE EARTH (*continued*).

Sep-tem-ber
an-nu-al
year-ly
thoughts
day
dai-ly
en-joys
owe
ow-ing
sun-light
sev-e-ral
du-ring

IT is clear that only that half of the ball which is turned towards the candle receives heat and light; the other half is dark and cold.

But as the ball turns round upon its wire axis, all parts of its surface will be brought, one after another, towards the candle, and will then enjoy its heat and light. This shows us how day and night are caused. It is day in that part of the earth which is in sunlight; and it is night in that part which is in shade.

Twice every year, about March the twenty-first and September the twenty-third, every part of the earth's surface makes half its daily rotation in the light, and half in the dark; so that the day and the night are then of just equal length all over the world. But at other times this is not the case. Owing to the slope of the earth's axis, the same part of the earth's surface receives more light and heat at one part of the earth's journey than it does at another.

Let us fix our thoughts on that part of the earth in which we live. As summer comes on, the sun seems every day to mount higher and higher in the sky; and so we get more and more heat. After March, too, the sun lights us for more than half the twenty-four hours; and the days grow longer and longer, until, on or about the twenty-first of June, we reach the longest day in the year. Then the days get shorter again, and the sun does not rise so high in the sky. It therefore gives us less heat. After September the sun gives us light for less than half the twenty-four hours. As winter comes on the days get shorter and shorter, until, on or about the twenty-first of December, we have the shortest day in the year.

Now, it is just six months from the shortest day to the longest day, and another six months from the longest day to the shortest day again; that is, twelve months, or a year in all. We see, then, that it takes just a year for the earth to travel round the sun. This yearly journey of the earth round the sun is called the *annual revolution* of the earth.

The earth, then, has two motions—its daily rotation and its annual or yearly revolution. It spins quite round once in every twenty-four hours; and, while it is spinning round, it is also moving onwards in its yearly journey round the sun.

The ends of the earth's axis are called *poles*. Owing to the leaning of the axis, it happens that, during a part of the year, that portion of the earth which is round the North Pole is turned towards the sun in such a way as never to lose sight of it for many weeks. Hence, during this time, it is never dark there. But, while the North Pole is turned to the sun, the South Pole is turned from it, and has no day at all. Six months later, all this is changed. Then the South Pole enjoys the sight of the sun and has no night, while the North Pole is in darkness and has no day.

LESSON VII.

THE SEASONS.

Eng-land
sea-sons
weath-er
nei-ther
height
lev-el
shade
shad-ow
be-neath
slant-ing
re-ceived
an-i-mals
fleece
flee-cy
flow-ers
fruit

As the earth travels round the sun, besides the changes in the lengths of the days and nights, there are changes of heat and cold.

The Four Seasons.—In England, the year is divided into four seasons, called spring, summer, autumn, and winter. We know that the summer in this country is often very hot, and the winter very cold. But, in spring and autumn, the weather is neither very hot nor very cold. It is from the sun that the earth receives all its heat. If the earth did not travel round the sun, one day at any part of the earth's surface would be about as warm as another; for the sun would then rise to the same height in the sky, and shine for the same number of hours every day at that place.

But we all know very well that the sun does not shine in this way. When we get *up early on a* summer's morning, we see the sun very low down in the eastern sky; his rays seem nearly level with the earth's surface, and the shadows cast by the trees and houses are very long. At the same time we feel that the air is chilly, and we say that the sun has not much power in the early morning. But the earth, by turning round, brings us more and more beneath the sun. The shadows become shorter, and the sun's rays grow warmer until noon, when the sun is highest in the heavens, and the heat is greatest. After noon the rotation of the earth turns us away from the sun. The shadows lengthen as the sun sinks lower and lower; and the day becomes less and less warm. At last, evening comes; and the sun is low in the western sky. Then it sets, and, again, we feel that the air is chilly.

From all this, we learn that the higher the sun is in the sky, or, which is the same thing, the less slanting his rays are, the hotter it is.

In winter, we not only see the sun for fewer hours every day, but we notice that, at noon, it is not so high in the sky as it is in the summer. Its rays are therefore more slanting, and the shadows are not so short as they are in summer.

The Cause of the Seasons.—As the sun itself does not grow hotter and colder, it must be the revolution of the earth that causes these changes of heat and cold. We must try and find out how this is.

In summer, the sun shines upon us for more hours, and its rays are less slanting, than in winter. During the short summer nights the earth has not time to lose all the heat it received from the sun during the long day; and so it is still quite warm when the sun rises next morning. But in winter the sun shines for fewer hours, and his rays are more slanting. The nights, too, in this country, are so long, that the earth not only loses all the warmth it received from the sun in the daytime, but also loses more and more of the warmth which was stored up in it during the long warm days of summer. So it gets colder and colder; and we then have frost, snow, and ice.

If no change were to come, but the nights were always longer than the days, then plants, animals, and men would soon die of cold.

But we know the change always does come; and the reason is, that the earth is always moving on round the sun. The days grow longer, the sun's rays feel warmer, the ice and snow are melted, the winter is gone, and the spring is come. With the warmer air, the trees begin to show their leaves, the fields grow greener, the birds are heard singing again, and so we pass through spring.

Then follows summer, with its bright flowers, and autumn, with its golden corn and its apples and pears. These quickly pass away; winter once more covers the ground and the leafless trees with its fleecy snow: the earth has made one more revolution round the sun, and the year is ended.

LESSON VIII.

THE AIR.

branch-es
for-wards
whirl-ing
breathe
breath-ing
rea-son
at-mo-sphere
im-por-tant
win-dow-pane
crick-et-ball
va-pour
gas-es
in-clo-ses
moist
breath

Air.—When we go out on a windy day we feel something blowing or pressing against us, which we say is the *wind*. We see the branches of the trees waving backwards and forwards; the leaves and straws and bits of paper go whirling down the street, and we say it is the wind that causes all this. We have often felt the wind, but we have never seen it. We ourselves can blow a leaf, or a straw, or a bit of paper about with the breath that comes out of our mouths; but we know that, before we do it, we have to take in a breath. When we take in a good breath, we feel something rushing into our mouths; and our lungs fill and swell, until we can take in no more. Now this something is *air*. As long as we live we are breathing; that is, we are always taking in and sending out air. If we ceased to do this, we should die.

The Air is all round the Earth.—Now, wherever we go, we are all the while taking in and sending out from our lungs this something which we call air. From this we learn that the air is around us everywhere. It is air that we force out of our mouths and lungs when we blow so as to make the leaf or piece of paper move; and the wind that sways the branches of the trees, and sometimes blows our hats off our heads, is only air moving along very quickly.

The air extends to a great height above our heads, and forms a large *sphere*, which incloses the smaller sphere of the earth, much in the same way as the outer leather covering of a cricket-ball incloses the inner part. Hence the whole body of the air is called the *atmosphere*, which word means the *vapour-sphere*.

It is very important to know about the atmosphere, not only because we could not live without it, but also because it has a great deal to do with the clouds, rain, snow, and winds, about which we are going to read later on.

Air is composed of Gases and Vapour.—If we breathe upon the window-pane, or any other cold thing, we see that the place on which we breathe becomes quite moist. The reason is, that there is always vapour in the air which we give out when we breathe, though we do not often see it. But the greater part of the air is made up of some other things which we cannot see, and which are called *gases*.

LESSON IX.

THE AIR (*continued*).

dense
den-ser
den-si-ty
dif-fer-ence
rap-id-ly
e-nough
ex-pands
con-tracts
sup-pose
heav-y
heav-i-er
blad-der
shrinks
weight
moun-tain
bal-loon

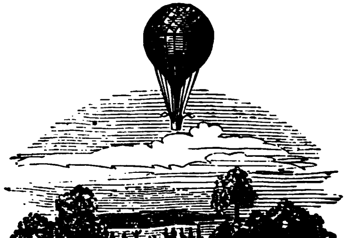
Density of the Air.—There is a great deal of difference between that part of the air which is near the surface of the earth, and those parts of it which are high above us. Persons who climb very lofty mountains, find it more and more hard to breathe the higher they climb. Persons who have gone up high in balloons have also found it hard to breathe; and, if they had risen very much higher above the earth, they would no doubt have died. The reason of this is, that the air gets lighter or thinner the higher we go; and as each breath taken fills the lungs with only this thinner air, we are obliged to breathe more rapidly in order to get enough air to keep us alive.

Even the air near the ground *feels* light; yet it is pressed down by the weight of all ***the mass of air*** above our heads; for each part of the air has to bear the weight of all the air above it. The higher we go, the less weight the air has to bear. That is the reason why it is not so dense, or not so closely pressed together, as the air lower down. In other words, the same weight of air takes up more room.

Air expands when Heated, and contracts by Cooling.—Suppose we take a bladder half filled with air, and tie the neck so that none of the air can get out. If we place this bladder in front of a fire, we see that it soon begins to swell, because the air inside takes up more room when hot than when cold. If we keep it near the fire long enough, the air will quite fill the bladder; and then, wanting still more space as it grows hotter, it will press more and more against the inside until the bladder at last bursts with a loud noise. But if we have a bladder which is quite filled with hot air, and we take it into a cold place, the bladder slowly shrinks, as the air inside becomes chilled.

This shows us that air, when it is heated, expands or takes up more room; and, when it is cooled, it contracts or takes up less room. *But, as air* expands, it becomes lighter and thinner; and, as it cools, it becomes heavier and denser. If a cork and a stone be placed in water, the cork, being lighter than an equal bulk of water, rises to the top; while the stone, being heavier than an equal bulk of water, sinks to the bottom. So when one part of the air is made hot and therefore light, the cold and heavy air about it pushes up the light air as the water pushes up the cork.

A balloon rises in the air because the gas with which it is filled is lighter than the gases which make up the air near the ground.



A BALLOON.

LESSON X.

THE AIR (*continued*).—MOISTURE AND VAPOUR.

tem-per-a-ture
moist-ure
ket-tle
piece
light-er
pro-du-ces
move-ments
at-mo-sphere
win-dow-pane

In the last lesson we read about the atmosphere, and learnt that air, when heated, becomes lighter than the cold air around it, and rises, while the cold air falls. The rays of the sun warm the surface of the earth, which gives out heat to the air near to it. We know that at night the earth's surface is not so warm as during the day, because the sun does not shine. In winter it is not so warm as in summer because the sun does not rise so high in the sky, and does not shine for so many hours each day.

Temperature.—When we wish to talk about the coldness and the warmth of anything we often use the word *temperature*. When a thing is cold, we say that its temperature is *low*; and when it is hot, we say its temperature is *high*. In the same way we call changes from being hot to being cold, or from being cold to being hot, *changes of temperature.*

As the air gets almost all its warmth from the earth, we can see that its temperature must change, whenever that of the earth changes. But this is always changing, and so the air is always moving. For when the heated air expands and becomes light, it is pushed out of its place by colder and denser air. A change of temperature, therefore, always produces movements in the atmosphere.

Moisture and Vapour.—The moisture in the air also expands and rises when it is heated, and contracts and falls as it grows cold. When a kettle of water is placed upon the fire, the water quickly gets hot; and, as soon as it begins to boil, we see, coming from the spout, a vapour which we call *steam.*

A very little water forms a great deal of steam. If we were to stop up the kettle-spout and fasten down the lid so that no steam could get out, and were then to place the kettle on the fire, in a very short time the steam would burst the kettle.

We can soon prove that steam is only a form of water, by holding a cold plate or a cold piece of glass in it. In a short time, we shall find the plate or glass covered with little drops of water: this is only the steam that has been chilled and turned into water again. In the same way, the vapour in our breath turns into water, when we breathe upon the cold window-pane.

Now, the greater part of the surface of the earth is covered with water in the form of oceans, seas, lakes, and rivers. Besides this, the land itself is often full of moisture from the rain, snow, and dew which fall upon it. The heat of the sun turns a great deal of this moisture into vapour, which rises and mixes with the air, and makes it lighter. This light, warm, moist air rises more rapidly than air which is quite dry; and thus this vapour causes more movements of the atmosphere than would take place if it were not present.

LESSON XI.

DEWS, MISTS, AND FOGS.

va-pour
e-va-por-ate
e-va-por-a′-tion
hoar-frost
count-less
sub-stance
moist-en
sub-stan-ces
re-gions
spark
spar-kle
spar-kling
re-fresh-ing
moist
flow-er
gen-er-al-ly
vis-i-ble
sea-coast
li-quid
me-tals
rap-id-ly

Evaporation.—We know now that the air always contains moisture or vapour, drawn up by the heat of the sun from the earth. This change of water, or any other liquid, into vapour is called *evaporation*; and evaporation is at all times taking place in most parts of the earth. What becomes of this vapour, and where does it all go to? We shall find that none of it is lost. It all returns to the earth as dew, mist, fog, rain, snow, or hail. We are now going to read how this takes place.

Dew.—You know how lovely the fields look in the early morning, when the sun is shining on the sparkling dewdrops, that *cluster on* the leaves and flowers! Dew is one of the forms in which the vapour, that has been drawn up from the earth, returns to it. At the close of day, when the sun goes down, the ground begins to give off its heat, and to grow cold. Then, just in the same way as the moisture in our breath turns into drops of water on the cold window-pane, so the moisture in the air turns into drops of water on the cold leaves and flowers. These drops of water are called *dew*.

Those substances which give out their heat quickly, such as grass, leaves, wool, or fur, receive most dew; while stones and metals, which retain their warmth for a longer time, receive little or none.

After a warm day, when the night is clear and the sky free from clouds, there is generally a heavy dew. That is because, on such a night, the earth loses its heat more rapidly, and therefore cools the vapour more readily and turns it into dew. But when there are clouds in the air, they prevent much of the heat of the earth from passing away, and so the ground is kept too warm for dew to be formed.

When the weather is very cold, as in winter, the ground is chilled so much, that the dew freezes as it forms. This frozen dew is called *hoar-frost.*

Very heavy dews are found near coasts, lakes, and rivers; because the atmosphere in such places contains much vapour. As it is the heat of the sun which causes evaporation, the atmosphere, in those countries where the sun is hottest, becomes full of vapour during the day, and therefore the dews at night are very heavy. These dews are of great service in refreshing the plants and trees; for, in those regions, there is often no rain for months, and, if it were not for these dews, every plant would wither and die.

Mist and Fog.—When warm moist air is cooled, its vapour becomes visible in the form of mist or fog. We can see this in winter, when the vapour in our breath turns into mist as it passes from our warm mouths into the cold air. Mists and fogs are often formed near rivers and lakes, and on the sea-coasts. The reason is, that the ground gets cold more rapidly than the water; and the vapour, rising from the water, is chilled by the cold ground, and becomes mist or fog.

It is thus by means of dews, and mists,

and fogs, that some of the water, evaporated from the earth by the sun, returns to moisten the earth again.

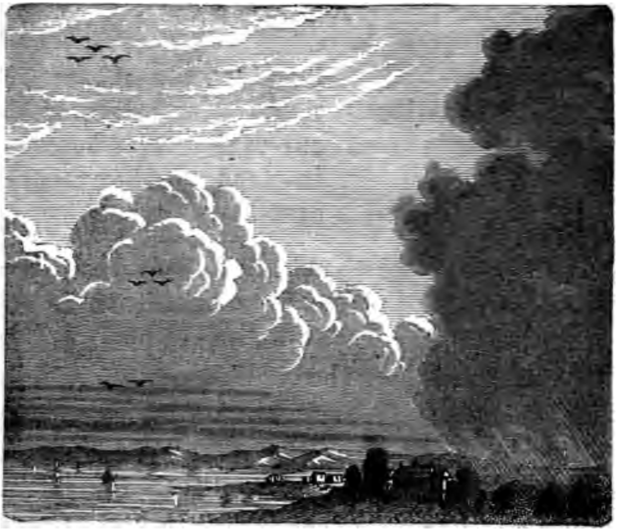
LESSON XII.

CLOUDS.

con-dense
con-den-sa-tion
earth-wards
touch-ing
re-gion
liq-uid
fields
cur-rent
in-stead
ceas-es
reach-es
bright-ly
cloud-less
ad-van-ces
wheth-er

Condensation.—How Clouds are formed.— The dews, mists, and fogs about which we were last reading are produced by the warm vapour touching the cold ground. They are therefore formed on or near to the ground, whether on low plains or on high mountains. We have learnt that evaporation is the act of changing a liquid into vapour. The changing of vapour back into liquid is called *condensation.* Condensation takes place whenever vapour is much chilled. When a current of warm air, containing much vapour, rises from the surface of the earth, it soon reaches a colder region of the atmosphere. Then its vapour begins to condense and takes the form of *clouds*. Indeed, a cloud is only a mist hanging in the air instead of resting on the ground.

We can often see for ourselves how the clouds are formed. If we were in the country during the summer-time, and were to get up very early in the morning, we should very likely see the fields covered with a mist or fog. Over our heads the sky



CLOUDS AND RAIN.

might be clear and blue, with here and there a star, whose light would grow dim as the sun rose.

As the sun's rays become warmer, the mist begins to evaporate; and, after a little while, we see it no longer. It has risen in the form of vapour into the air above us. If we look at the grass, we notice that there is a great deal of dew left behind, which sparkles in the sunlight. As the sun's rays become still warmer, their heat changes the dew into vapour, and at last the grass becomes quite dry. And now, when we look up we see that clouds have been forming in the sky, small and thin at first, but growing into thick white masses as the day advances. These clouds are formed of the dew and fog, which were evaporated by the sun. The vapour from them has risen into the colder regions of the atmosphere, and has been again changed into mists.

When the heat of the day is over, the warm vapour ceases to rise, and the clouds begin to grow smaller and to sink earthwards. As they come lower, they reach warmer air, and the mist which they contain is again turned into vapour. At last the sun sets, and we see that the sky above us is again clear, and blue, and cloudless, with countless stars shining brightly in it, while dew and mist are again being formed upon the earth.

LESSON XIII.

RAIN.

rise
ri-sing
por-tion
hill-sides
set-tled
float-ed
de-scend
al-though
pro-duced
some-times
show-er
con-densed
cloth
clothe
clothes
wedge

ONLY a part of the vapour rising from the earth returns to it in the form of mist, and fog, and dew. By far the greater portion of it falls in the form of *rain*. If we go out when there is a thick mist all around, we see that it covers our clothes with a great number of very tiny drops of water. These little drops of water are so small and light, that before they settled on us they had floated about in the air, and formed the mist. Just in the same way, little drops float about high up in the air, and form clouds. If the air becomes colder, the clouds also grow cold; and then these tiny drops become larger. These larger drops, being too heavy to float in the air as mist, begin to fall upon the earth; and so we have a shower of rain.

How Rain is produced.—Rain is produced in several ways. When a moist wind blows across land colder than itself, its vapour is condensed and falls as rain.

Sometimes a warm moist wind travels along until it meets a range of mountains; and, as it cannot blow through them, it is forced to rise up their sides until it reaches their tops. It then blows over them. But, as it rises, it expands and grows colder, and its vapour is soon turned into mist, which, if cooled still more, falls down as rain upon the hillsides and valleys.

At other times a cold wind (which being heavy, keeps close to the ground) forces its way beneath a stream of warm moist air, and condenses some of its vapour. At the same time the moist air, being thrust upwards by the wedge of cold air below, comes into a cold region, where its vapour is soon condensed into clouds and rain.

When a country is level, unless the air of the country is colder than the winds, no rain will fall, although the winds may be full of vapour. But, as we have just read, mountains force the wind upwards into colder regions, where its vapour is condensed into the mist and clouds which so often cover the peaks and sides of a mountain range. These mists and clouds descend into the valley as rain. Hence it is that, in those parts of a country which are hilly, much more rain falls than in those parts which are flat.

VAPOUR CONDENSED BY A MOUNTAIN.

LESSON XIV.

FROST.—ICE.—SNOW.—HAIL.

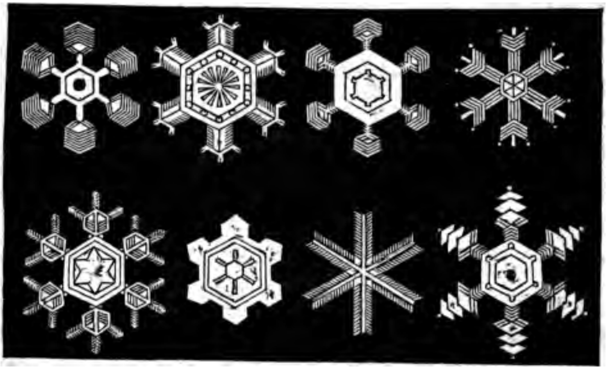
freeze
fro-zen
dif-fer-ent
gar-ment
read-i-ly
mix-ture
par-ti-cles
pow-der-y
snow-ball
e-nough
knock-ing
hail-stone

Frost and Ice.—When water is very cold, it freezes; that is, it becomes quite hard and solid. We then call it *ice.*

In this country during the greater part of the year, the vapour which is condensed in the air falls either as mist, or as rain, or as dew. But, when the weather is very cold, instead of rain we have *snow,* and instead of dew we have *hoar-frost.*

There are in the world, even in very hot countries, a great many mountains whose tops are always covered with snow and ice—often of very great thickness. This shows us that, at a certain height, the air is always cold enough to freeze water; and some of the clouds which float high up in the sky are, very likely, not clouds of mist but clouds of snow.

Snow.—In warm weather, when these clouds begin to sink, the snow which forms them melts, and rain falls. But, when the air all the way down to the ground is very cold, the snow falls without melting, and covers all things with a soft white garment. If we look closely at fresh snow, we can sometimes see that it is made up of very little spikes of ice, which are joined so as to form stars with six points or rays.



SNOW CRYSTALS (MUCH ENLARGED).

When the air is very cold, the particles of snow are fine and powdery, because they do not stick together when they touch, as you will find if you try to make a snowball of them. But, when the air is only just cold enough to prevent the snow from melting, *the particles*, knocking against each other, stick together and form large flakes. That is the time to make good snowballs.

Use of Snow.—The snow which falls in winter is often of great use. It covers the ground like a blanket, and hinders the soil and the plants on which it lies from readily parting with their warmth. In this way, the tender shoots and roots of the plants are saved from the severe frosts, which would kill them, or at least do them great harm.

Hail.—Sometimes the frozen water in the air falls in hard round bits of ice, like frozen drops of rain. These little masses of ice we call *hail*. The hailstones may be very small, like fine shot, or they may be as large as hens' eggs.

Hail is more common in warm weather than in cold. It very often falls during thunder-storms. If snow and rain, or hail and rain, fall at the same time, we call the mixture *sleet*.

Hoar frost, snow, and hail are only different forms of ice which water takes when it is frozen in the air.

LESSON XV.

THE WINDS.

mo-tion
great
grate
hap-pen
cur-rent
draw
drawn
draught
di-vides
ex-tent
e-qua-tor
stream
stream-ing
wa-ter-ing
a-mount
fruit-ful
per-haps
move
mo-ving
sup-ply

Causes of Winds.—Wind is air in motion. Air is put into motion by the changes of heat and cold. When a fire is lighted in a grate, it soon warms the air in the chimney. This air takes up more space when warm than when cold, and therefore some of it must flow out at the open chimney-top. The warm air in the chimney is then lighter than the air in and about the room. This air then rushes to the fireplace, and lifts the lighter air out of the chimney. And so a stream of air is kept up which is called a *draught,* because it seems to be *drawn* towards the fire.

If a great fire were lighted in the open air, where there was no chimney, much the same thing would happen. Streams of cold air would rush towards the fire, and streams of hot air would rise from the fire.

In fact, so long as one place is hotter than another the air will not be still, but will move and produce *wind*. The cold air, being heavier bulk for bulk than the hot air, will flow under it, and thus a stream of cold air will sweep over the ground. And in the higher parts of the atmosphere, the warm light air will flow over the denser air, and thus produce an upper current.

The air is moving in this way all over the world, but it does so to the greatest extent in those parts which lie near to the *equator*; that is, midway between the two poles. There the sun's rays have most power, and so there the greatest amount of air is heated and the most vapour formed. The warm air is lifted up by the cold air which is always rushing to this heated belt from the north and from the south. For this reason, the winds on one side of the equator blow from the north, and on the other side from the south.

But what becomes of the heated air and vapour which are lifted up by the cold air? They rise into the colder regions of the atmosphere. There this great upward stream of air and vapour divides, one part passing to the north, the other to the south, to supply the place of the cold air which has all the time been streaming to the equator.

By the time the northern stream reaches our country, it has come to the surface of the earth again, and forms the south, or south-west, wind which so often blows here. Being warm and laden with vapour, it brings rain; and so it is of great use to us in watering the ground and making it fruitful.

Sometimes we can *see* that there are upper and lower currents of air; for whilst we feel the wind blowing *from* the south, we see the clouds moving *towards* the south. Or, perhaps, the lower clouds are moving one way, while the higher clouds are moving another.

LESSON XVI.

THE WINDS (*continued*).

tem-per-a-ture
moist
mois-ten
mois-ture
re-fresh-ing
an-i-mal
riv-er
drowned
pleas-ant
de-stroy
car-ry
car-ries
car-ried
breeze
breez-es
heal
health
dam-age
pro-mote
schools

Work of the Winds.—As some winds are warm and others cold, some moist and others dry—they warm or cool, moisten or dry, the land across which they blow. There are, in fact, two kinds of work done by the winds. First, they cause changes of temperature—that is, changes of heat and cold—and then they carry about and scatter moisture. If there were no winds, the vapour drawn up out of the oceans and seas would hang above them in clouds, and fall down into them again as rain, and would not reach the land. The ground would then become parched, so that no animal or plant could live on it.

The Winds carry Moisture with them.—The moisture which is drawn up out of the soil, forms only a very small part of the rain which falls upon it. Most of the rain is formed from the vapour of the ocean. The winds carry this vapour over the land, where it takes the form of clouds, mist, or rain. Much of the rain which falls upon the land sinks into it; the rest finds its way into the rivers, and so back again into the oceans. There it is once more evaporated, and then carried by the winds to water the land afresh. But winds do not always bring rain, and, after heavy showers, they are often of great use in drying the soil.

Changes of Temperature produced by the

Winds.—Winds do more than this. When a wind blows from a hot country, it carries warmth with it to colder countries, and often makes them more pleasant to live in. On the other hand, a cold wind tends to cool those places where the air is very hot.

The Uses of Winds.—Winds, then, sometimes cool and sometimes warm us; they bring us pure air and refreshing showers, and in many other ways promote the health and growth of plants and animals. At times, as we all know, the wind is very strong, and we have what we call a *storm.* Storms often do a great deal of damage, both on sea and on land. They destroy ships, and sometimes all on board are drowned; and on land they blow down trees and houses. Yet even storms do much more good than harm. They blow away all the bad air, and fog, and smoke which hang about our large towns. Even in the country, where the air is fresh, we may notice how much sweeter it seems after a storm.

We should not shut the winds and breezes quite out of our rooms, or houses, or schools. If we do, we shall become pale, and weak, *and sickly.* Through not knowing this, or not attending to it, many persons die every year, and many more live in pain and have no joy in their lives. Now that we know something of the use of winds, we will let them blow in upon us, so long as we do not catch cold; and they will bring with them sweet fresh air to make and keep us well and strong.

LESSON XVII.

WHAT WIND CAN DO.

flu-id
per-ceive
re-al
fly-ing
Ban-bury
No-vem-ber
roared
thou-sands
scarce-ly
quar-ter
peo-ple
stayed
scat-tered
Sev-ern
drowned
Ed-dy-stone
light-house
un-der-stand
mis-chief
drop-ped
whirl-wind

THERE are many persons who never find out that they have about them, at all times, this fluid substance which we call air. We cannot see it, nor taste it, nor smell it; and it lies so softly about us, that unless we take notice of what happens around us, we do not perceive that we live and breathe in air, and that air is as real a substance as the water in which fishes live.

Yet, as we have now learnt, the wind, which we can often hear and feel, and which blows down tiles and chimney-pots, and sends our hats flying along the streets, is only air in motion. Sometimes the wind does greater mischief still.

A WINDY DAY.

In the month of November, 1703, a great storm of wind passed over this country. It is said that it roared like thunder. Hundreds of houses were blown down, and thousands of chimney-pots; and scarcely a house or church was left with a whole roof or window. The people were in great fear. Some who rushed into the streets, and some who stayed indoors, were alike killed by falling houses and chimneys.

In every park great trees were torn up by the roots, and on the farms the stacks of corn and hay were scattered about. More than 800 houses, 400 windmills, and 250,000 timber trees were blown down.

At sea it was no better. Three hundred large vessels were lost on the coast, and more than 900 small ones in the river Thames. It is said that more than 8,000 persons were drowned.

Some of the rivers were flooded; and 15,000 sheep, and many cattle, were in this way drowned in the river Severn alone.

The Eddystone Lighthouse was blown down, and all the persons in it lost their lives. Even the large blocks of stone, which had been joined to the rock with great bars of iron, were torn up and swept into the sea, and not a bit of the lighthouse was left.

There have been many other storms since

that of 1703; one or two of them have perhaps been worse than that. But what you have now read will help you to understand what the wind can do.

In very hot parts of the world the storms are often much worse than we ever see them in this country. Sometimes the wind whirls quickly round, and it is then called a *whirlwind*. Clouds of dust and sand may be caught up by the whirlwind, and be carried round and round in the air. When strong gusts of wind spin round in this way out at sea, they do great harm to any ships that may be within their reach.

LESSON XVIII.

THE EARTH'S SURFACE.—RIVERS.

care-ful-ly
ta-ble-land
form-a-tion
[illegible]eive
climb
stream
ditch-es
prod′-uce
gut-ter
chan-nel
run-ning
sup-ply
tric-kle
pour-ing
to-geth-er
va-ri-ous

[illegible]he Surface of the Earth is not Level.— [illegible]ll know that the surface of the earth is [illegible]l like a table, or like the floor of the schoolroom. Even if we live in a part of the country where there are no high hills, yet, when we go for a walk and look carefully around us, we soon see that there are a good many 'ups and downs,' as we call them. There are very few parts of England where we can walk any great distance, either in town or country, without having to climb up and go down hills. And it is much the same in other countries. Though there are parts of the earth's surface called *plains* or *table-lands*, where the ground is nearly level, yet, on the whole, we may say that the land is nowhere quite flat.

Formation of Streams.—As we walk along the road or street on a rainy day, we see the water running in little streams from the middle of the road to the gutter or channel on each side. The water runs along the gutter until it reaches the drain or the ditch. If we could follow it further, we should find that it flows along the drain or ditch, until it reaches the river, which carries it, along with the water of many other drains and ditches, far away to the sea.

It is in this way that many rivers are formed. The rains and mists which fall upon the earth, trickle in tiny streams down the mountain sides into the valleys below; for water cannot remain on ground which is not quite level, and it always runs downhill. After a shower, thousands of these little rills may be seen pouring down the sides of the hills. By the time they reach the foot of a hill, several of these rills have joined together, and so formed a little stream.

This stream grows wider and deeper as it receives the water from other rills, until at last it becomes large enough to be called a river. The river still flows on, growing in size as other rivers join it, until, at last, it reaches the sea.

If the land were quite level, the rain would remain where it fell until it soaked into the ground, or was evaporated by the sun's heat. Let us now see what the rivers do for us.

Rivers supply us with Water, &c.—Rivers supply our villages and towns with fresh water, without which people cannot be well [illegible] strong. As the rivers flow along, they [illegible] the ground on each side of them, and [illegible] it fit for the growth of trees, and [illegible] kinds of crops.

Rivers also supply us with many kinds of fish which are good for food. Barges, boats, and even ships are able to float on some rivers, and to carry up and down the produce of various parts of the country.

LESSON XIX.

THE WORK OF RIVERS.

fall-en
mud-dy
wash-es
car-ries
de-gree
rap-id
wide
wi-dened
scooped
peb-bles
fer-tile
wear-ing
bar-ren
checked
tracts
del-ta

Rivers alter the Surface of the Land.—Rain as it falls is quite clear, like the water we drink. But when it has fallen upon the road, it is quite muddy, because it washes the road, and carries with it the dust which was lying there.

What we see taking place upon the road, takes place all over the world, where-ever a stream of water finds its way. As the streams rush down the sides of the mountains, they wash away bits of loose rock and earth. These rub against the sides of the mountains as they are hurled along; and so they help the stream to wear a channel for itself.

What the little streams do, the rivers also do in much greater degree. Where the land slopes very much, the rivers are rapid; and stones and gravel, as well as sand, are carried along by them.

All over the world, the rivers have been wearing the land away, ever since they first began to flow. They have washed the earth and loose stones from the hillsides, and have widened their beds by eating away the banks. In some places they have scooped out deep channels through the hard rocks, so that we find the river-banks are now high above the water of the river.

CHANNEL WORN BY RIVER.

Where the land does not slope much,

the rivers flow slowly, and leave behind the pebbles and sand and mud, which they bring down from the mountains. By degrees the stones and sand fill up the bed, and form banks in the river. At last these banks grow too high for the water to flow over, and then the river turns aside from them, and they become dry land.

Some rivers are subject to floods. The stream then rises and overflows its banks, and the sand and mud in the water settle down on the land at the sides of the river. In this way new soil is formed which is often very fertile.

We can thus see that, while in some places the rivers are wearing deep channels in the land and making it more uneven, in other places they are washing away mountains and filling up valleys. Each stream has been working in this way from the time when it first began to flow. The amount of stones and sand which has been worn off the rocks and carried into the valleys during all this time is very great. Many barren valleys have been filled with a rich soil, fit to grow all kinds of useful crops.

But it is only a part of the sand and

mud which the rivers contain that is left in the valleys. A great portion is carried down to the seas into which they flow. When the stream meets the tide flowing from the sea, its motion is checked. The sand and mud then begin to sink down, and so they form large banks at the mouths of rivers. By the *mouth* of a river we mean that part where it enters the sea. Some rivers carry down so much sand and mud, that, in the course of years, they have filled up a part of the bed of the sea, and formed large tracts of dry land. The land formed in this way at the mouth of a river is called a *delta.*

LESSON XX.

THE SOURCES OF RIVERS.

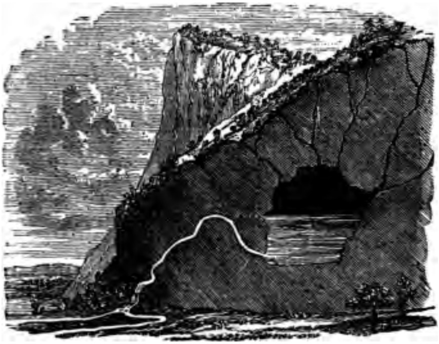
source
sour-ces
straight
hol-lows
col-lect
pud-dles
piece
marsh
sponge
spon-gy
tread
over-flow
ground
un-der-ground
glá-ciers
fu-ture

We have before seen that some rivers are formed by mountain rills, but many are formed in other ways.

Lakes.—The rain which falls upon the land does not always run off straight into the rivers. There are very often large hollows in the ground, in which the water collects as it does in the puddles in the road, or in the ponds in the fields. When these hollows filled with water are large, they are called *lakes*. Most lakes have a river flowing out of them. When that is the case we say that the river *takes its rise*, or has its *head* or *source* in that lake.

Marsh or Bog. — In some parts of the country, often where there is a piece of level ground lying between hills, we find what is called a *marsh* or *bog*. This is a very wet place in which soft mosses and such like plants grow. These mosses soak up the water like a sponge, so that we cannot see it until we tread upon the moss. Then we find that we get very wet. The rain often collects in these marshes until they are so wet that they cannot soak in any more, and then the water begins to trickle from them in a little stream. In this way a river sometimes takes its rise in a marsh or bog.

Springs. — The rain-water very often trickles through soft and spongy ground, or runs through cracks in the hard rock, until it finds a hollow in which it collects. After a time the water fills the hollow and begins to overflow. It then finds its way underground until it meets with a crack through which it can flow out. Water which pours out from the inside of the earth in this way is called a *spring*. Some of these springs flow all the year round; others flow for a time and then stop. Many rivers take their rise in springs.



SECTION OF A SPRING.

Melting Ice and Snow.—Glaciers.—There is one other way in which the rivers obtain their water, and that is from the melting of ice and snow. It is always cold on the *tops of* high mountains and in high valleys.

Some of these are so cold that they are covered with snow and ice both in summer and in winter. The snow and ice are often frozen into a great mass, which slides very slowly down the mountain-sides and along the valleys, till it comes where the air is warm. Then it begins to melt, and forms a river source. These masses of moving ice on the mountain-sides and in the higher valleys are called *glaciers*. We shall read more about them in a future lesson.

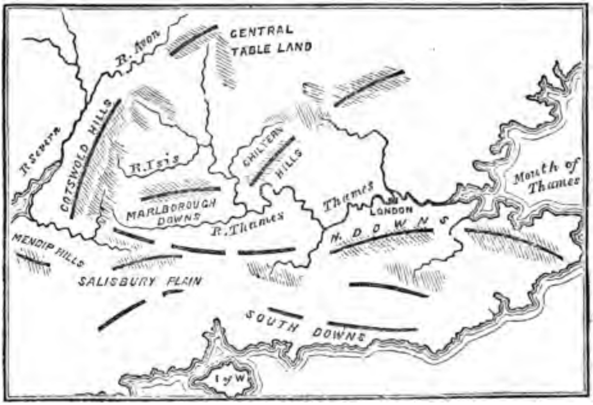
LESSON XXI.

RIVERS (*continued*).

tri-bu-ta-ry
wa-ter-shed
wa-ter-part-ing
wa-ter-fall
ware-house
down-hill
drained
ba-sin
cat-ar-act
build-ing
rap-id-ly
rough
head-long
har-bour
sea-coast
dis-charge
car-go
car-goes
safe-ty
rail-way
slight-ly

THE source of a river, then, may be a mountain rill, a lake, a marsh, a spring, or a glacier. As a river flows along it is joined by other rivers, which are called *tributaries*; and in this way it becomes wider and deeper.

River Bed.—The course, or way, worn by the river is called its *channel*; the ground over which it flows is the *bed*; and the ground on each side is a *river bank*.



THAMES RIVER BASIN.

River Banks.—There are always two banks to a river—the *right* bank, and the *left* bank. The right bank is the one on the right hand of a person passing along the river from its source to its mouth; and the left bank is the one on his left hand. As a river always flows downhill, going *up* a river means going along it from its mouth towards its source; and going *down* a river means going along it from its source towards its mouth.

River Basin.—The whole extent of land drained by the river and its tributaries, is called the *basin* of the river. We often find the streams on one side of a hill flowing down into one river, while those on the other side of the same hill flow into another river.

Water-shed or Water-parting.—The line or ridge that divides one river basin from another is called the *water-shed* or *water-parting* of these basins.

Rapids and Cataracts.—Rivers do not flow with the same speed along their whole course. Where the land slopes steeply, the rivers run fast; and where it slopes only slightly, they run slowly. As the land slopes most among the mountains, where rivers rise, and is more level towards the sea-coast, we often find that rivers are very rapid during the first part of their course, but flow more and more slowly as they come near the sea.

Sometimes the bed of a river slopes very much, or forms steps of rock over which the water pours very rapidly. Such places are called *rapids*.

If the steps of rock are larger, so that

WATERFALL.

the water is broken up and rough, the river then forms a number of little falls, which [illegible] called *cataracts.*

Waterfalls.—Sometimes the bed of a river leads to the edge of a high rock, over which the river rushes headlong. These places are called *water-falls.* Some waterfalls are so large, that the noise of the falling water sounds like thunder, and the spray rises up into the air in white clouds. The banks around them are often filled with trees and plants, which are kept fresh and green by the spray from the water.

River Mouth.—Ports and Harbours.—The part of a river where it enters a lake or sea, is called its *mouth.* The mouths of rivers are often of great use as *ports* or *harbours,* which are places where ships can discharge their cargoes with safety. Most of the large ports are at the mouths of rivers. One reason is, that, until railways were made, the rivers were the best roads for bringing goods and produce down to the sea. These goods are stored up in large buildings called *ware-houses.* They are then packed in ships, which sail away with them to other parts of the world.

LESSON XXII.

AVALANCHES AND GLACIERS.

av-a-lanche
e-nough
tear-ing
pie-ces
bu-ry
squeez-ing
snow-ball
nar-row
pas-sage
tongue
gla′-cier
chip-ped
grav-el
scratch-es
ex-am-ine
pic-ture

We have read that a river is sometimes formed by the melting of snow and ice on the tops and sides of high mountains. Snow and ice have a work of their own to do; and we are now going to read what their work is.

Avalanches.—We have read that there are some mountains so high, that no rain, but only snow, falls upon their tops and high slopes. As this snow is often falling, and the sun is never hot enough to melt all of it, even in summer, it would be always growing deeper and deeper, unless it was taken away by some other means.

There are two ways in which these mountains get rid of the snow which falls upon them. When the mountain slopes are *very steep, and* the weight of the snow is great, masses of the snow slide down the mountain, as you may have seen snow in winter time slide down the roof of a house. The masses move slowly at first, and then faster and faster, till, at last, they rush down with very great force, and fall into the valleys below. The noise which they make as they rush down is like thunder; and they often do a great deal of damage, tearing up trees and large pieces of rock and earth. Sometimes they bury houses and even whole villages. These snow-falls are called *avalanches*. By means of avalanches, then, the mountains get rid of some of the snow which falls on their tops.

Glaciers.—Where the mountain-sides are less steep, and where therefore the snow can lie without falling down in avalanches, a change takes place in the snow. We all know how soft and light newly-fallen snow is. But, by squeezing a handful or two of it, we can make a hard snowball; and, by very hard squeezing, we can get a ball which is a solid mass of ice.

This is what happens on the mountains. When a great deal of snow has fallen, the lower parts of it are pressed and squeezed together by the weight of the snow which lies above. This goes on, until the lower part of the snow becomes clear blue ice. The weight of this snow and ice forces the mass to slide down the slopes of the mountains into the valleys.

GLACIER.

As a broad sheet of such ice slowly creeps downwards, it sometimes has to make its way through a narrow passage, where it is crushed and broken by the rocky sides of *the valley.* But it quickly freezes together again into one solid mass. Fresh snow keeps falling, so that fresh ice is always forming and sliding down towards the valleys. Thus all the upper part of the valley is filled with a great tongue of ice, which is called a *glacier*.

The Work of Glaciers.—The great weight of the ice enables it to wear away the rocks over which it moves. Large pieces of rock are chipped from the mountain-sides by the frost, and these pieces fall upon the ice. As the glacier slowly moves along, it carries these pieces of rock with it, often for many miles.

Some of the smaller pieces of rock fall down through cracks in the ice, and so reach the bed of the glacier, where they are ground down into gravel, sand, and mud. As this goes on, the moving stones make great scratches on the rocks in the bed of the glacier, and they are themselves scratched by the rocks.

The clay in some of our brick-fields is the remains of rocks which have been ground down in this manner. If you examine some of the stones in the clay, you will find them scratched.

As the glacier reaches the lower part of the valley, where the air is warmer, the ice melts, and the water flows away as a river.

LESSON XXIII.

THE OCEANS.—THEIR WORK AND USES.

o-ce-ans
sup-ply
mois-ture
con-densed
sup-pose
through-out
suit-ed
in-creaseˋ
of-ten
cause
caus-ing
cur-rents

Oceans supply the Moisture for Mist and Rain.—If we look at the globe, or at a map of the world, we see that by far the greater part of the surface of the earth is covered by vast sheets of water, which are called *oceans* and *seas*.

The heat of the sun is always turning some of this water into vapour, which forms clouds. Some of these clouds are blown by the winds across the land. There they are condensed and fall as rain, or dew, or snow. Part of the rain sinks into the earth and waters the plants. But a great part of it runs away into the rivers; *and they carry* it back again to the sea.

Thus the moisture, without which men, beasts, and plants would soon die, is all the while finding its way from the oceans to the land, and then back again to the oceans.

Oceans alter Temperature.—When the sun shines, its rays quickly warm the surface of the ground; and the heat passes slowly into the soil. As the ground becomes hot, it heats the air above it, and in this way increases the heat of the weather. But just as the ground is quickly heated, so it cools very quickly when the sun has gone down.

On the other hand, water takes a much longer time to heat and a longer time to cool. Hence the ocean does not become so hot as the land does. In hot weather, countries which are near the oceans are never so hot as those which are more distant; because the hot air on the land is all the while rising, and its place is taken by cool air from the sea. Again, since the water does not cool so quickly as the land, countries near the ocean never have such cold weather as those which are far from it. The air above the sea is then warmer than that over the land, and so the sea breezes often warm the land in winter.

Ocean Currents.—But we must not suppose that the water of the ocean remains quite still. First of all, in every twenty-four hours there are two *tides*, when the water rises and falls on every shore in turn.

Then the winds set the surface-water in motion, causing what we call *waves*. They also help to produce streams in the sea, which are called *currents*.

The water in the ocean also moves throughout its entire mass. Cold water from the north and south creeps slowly along the floor of the ocean towards the equator, pushing up the warmer and lighter water. At the same time this warm water flows from the hot parts of the earth towards the north and the south. These warm currents make the countries whose shores are washed by them less cold in winter than they would be without them. So the earth is made more pleasant for men, and more suited for the life of plants and of animals.

LESSON XXIV.

THE WORK OF THE OCEANS (*continued*).

fringe
shin-gle
depths
hurl
crum-bles
sea-beach
form-a-tion
set-tling
quan-ti-ty
re-mains
bu-ried
bot-tom
isle
is-land
chief-ly
ex-cept

JUST as the water in the streams and rivers slowly wears away the hills, so the ocean wears away its shores. Twice every twenty-four hours the waters of the ocean rise and fall; and this must in time wash away the sand, and shingle, and even the hard rocks which fringe the sea.

The Action of the Waves on the Land.—But much more work can be done by the great waves which dash against the shores when there is a storm. Every blow from these waves tears up stones or crumbles rock, so that, little by little, they fall down into the water below.

But even here they do not lie at rest. The waves hurl back the stones with great force against the rock from which they have fallen. In this way the rocks are slowly worn away. The small pieces are carried up and down the beach, and rubbed one against the other, by the waves, until they become the smooth round shingle which we find upon the sea-beach.

WAVES BEATING AGAINST THE LAND.

This goes on without ceasing; so that in time the shingle is ground into sand and mud, much of which is carried out to sea and sunk in the depths of the ocean.

When the cliffs which line the shore are made of clay or soft earth, the waves do much more damage, and wash away every year a large quantity of land.

CLIFFS AND BUILDINGS UNDERMINED BY SEA.

Formation of Land.—Thus the land is worn away by the action of water, and a great portion of what is washed away is carried far out to sea. There, in the still depths, the mud and sand are ever settling, until, by some movement in the earth, the sea bed is raised and becomes dry land once more.

Much of what is now dry land has once been part of the sea bed. We learn this from the rocks. In them we find sea-shells and the remains of fishes which could have lived only in sea-water. These remains were buried in the fine sand and mud brought from the land; and, after a long time, that part of the sea bottom was lifted up and became dry land.

The bottom of the ocean is in some places uneven. It has, here and there, deep valleys and high mountains as the land has; but they are so far down that we cannot see them, except when the mountain-tops rise above the water and form islands. The mud which is washed from the cliffs of the shore settles chiefly in the valleys of the ocean bed.

LESSON XXV.

THE SURFACE OF THE EARTH.—MOUNTAINS.

hil-locks
coast-line
peo-ple
tun-nel
sum-mit
rock-y
peak
climb
base
ba-ses
va-ry
nar-row
Scot-land
de-file
at-tacks
en-e-mies

Mountains, Hills, Hillocks. — The line where the land and the water meet is called the *coast-line*; and that part of the land which is washed by the tide is called the *shore.* If we land upon the shore of any country and walk inland, we find that we have to go uphill. In some countries the land rises only a little above the level of the ocean. But in most countries it is found that, as people travel inland, they rise higher and higher above the level of the ocean, until they reach what are called *hills* and *mountains.* A part of the earth rising high above the land around it is called a mountain. If it does not rise to a great height it is called a hill, and small hills are called *hillocks.* The bottom of a mountain or hill is called its *foot* or *base,* and its slanting sides are its *slopes.* The top of a mountain or hill is called its *summit*; or, if it is pointed and rocky, its *peak*.

Mountain Range.—When a number of mountains are in a line, and so close together that their slopes and bases join one another, they form what is called a *mountain range* or *chain*.

Mountains vary very much in height. The highest mountain in the world is in Asia. It is nearly seven times as high as any mountain in England, Scotland, or Wales.

Use of Mountains.—Pass.—Defile.—Mountains are useful in many ways. They serve to catch the rain-clouds as they are driven along by the wind. The rain then pours down upon their summits and slopes, and feeds the springs and streams which form the rivers. Mountain ranges serve also to protect a country. The ocean serves as a means by which people can easily travel from one country to another; but it is very hard work to travel over mountains.

If a man is to get to the other side of a mountain, he must climb over it or make a tunnel through it. If he has to climb over it, he looks for the lowest gap he can find between two of the summits. Sometimes this gap is wide and open, with mountain slopes on each side: it is then called a *pass.*

If the gap is narrow and shut in on each side by steep rocks, it is called a *defile.* It is not an easy thing for people to cross mountains, even when there are passes or defiles through them. Mountain ranges thus protect a country from the attacks of

DEFILE AND PRECIPICE.

enemies. But they also shut in those who live there, and shut out peaceful traders; and so the people have but little trade with others, and are often very poor.

Plains.—In most countries there are tracts of land which are nearly level, and along which we might travel for many miles without having to climb a mountain or even a hill. These level tracts of land are called *plains.* Some plains are covered with grass, and others with shingle and sand.

Table-lands.—When these level tracts of land are high up among the mountains, they are called *table-lands*; because, like a table, they rise up above the ground near them.

LESSON XXVI.

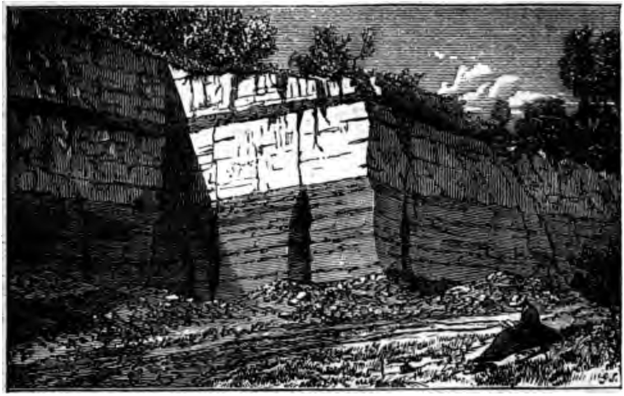
SOIL AND ROCKS.

nei-ther
be-neath
sur-face
min-e-ral
rot-ten
re-mains
pro-vide
dif-fer-ent
quar-ry
in-stead
hap-pened
cut-ting
tilt-ed
cracked
bro-ken
pushed

We have now learnt something about the surface of the earth. We have read that part of it is water, and part dry land. There is about three times as much water as land. We have also read, that neither the dry land nor the ocean bed is level; but that both are broken up into valleys, and rising ground, and mountains. We have read, too, how the waves, and streams, and glaciers wear away the land bit by bit. We must now learn something about the soil, clay, sand, and other rocks, which form the land upon which we walk.

A MINE.

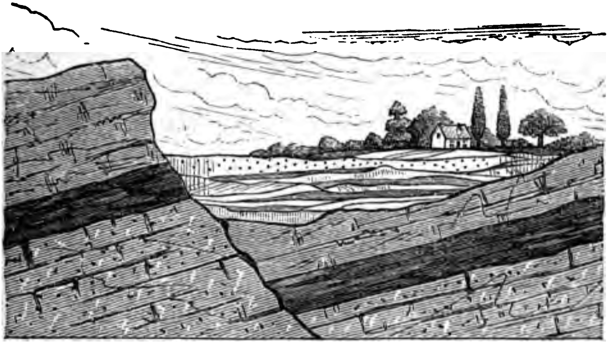
Mines.—There are several ways in which we can find out what the ground beneath us is formed of. Mines, and other deep holes, have been dug into the ground in many parts of the world, in order to get at the coal, iron ore, gold, salt, and other minerals, which are found in the earth. But we need not go down a mine to get a notion of what the earth is made of.



BEDS OF ROCK IN A QUARRY.

If we go into a field we see the ground covered with grass, or corn, or some other plant which is rooted in the soil. The soil is made up of sand, or clay, mixed with remains of leaves, and roots, and animal matter. These remains provide much of the food by which plants grow. If we dig *a hole in this* field, we soon get through the soil out of which the plants grow, and reach sand, or gravel, or clay, which looks quite different from the soil, because it contains little or no remains of plants and animals. If we dig through these, we find some kind of hard stone or rock below.

Different Layers of Soil and Rock.—Or, we may watch men sinking a pit, or cutting stone out of a quarry. We then see that the soil, sand, clay, chalk, sandstone, and other rocks, often lie above one another in rows or layers, like the courses of bricks in a wall, or like the sheets, blankets, and quilt upon a bed. These layers of rock are called *beds*.



BROKEN AND SHIFTED BEDS OF ROCK.

Again, when we go up a mountain, we *often* see the rocks with little or no soil upon them. If we look closely at the bare rocks, we may notice that some of them, instead of lying flat one above the other, like a pile of books, seem to have been pushed up or tilted, and cracked or broken by some great force. This is just what has happened. Most of the mountains are only portions of the once level surface of the earth, or even of the sea bed.

LESSON XXVII.

VOLCANOES.

vol-ca-no
vol-ca-noes
be-lieve
pour-ing
la-va
Eu-rope
Na-ples
in-jured
mere
guess
huge
ba-sin
bowl
A-si-a
It-a-ly
fre-quent
o-pen-ings
A-mer-i-ca
o-ver-grown
frin-ging
Pa-cif′-ic
fa-mous
built
con-stant
ac-count
cra-ter
ex-tinct
ac-tive
Ve-su′-vi-us
ol-ives
sud-den-ly
trou-ble
thou-sand

THERE are some rocks which have not been formed of sand or mud, and which are not found in layers. These rocks from their look lead us to believe that they were once in a melted state. They seem to have flowed over other rocks, and then to have slowly cooled.

Volcanoes.—This is not a mere guess, for we can, in the present day, see for ourselves this pouring forth of melted rock going on. In many parts of the world there are *volcanoes*, which are hills having deep openings leading down into the earth. The mouth of such an opening is much like a huge basin, and on that account is called a *crater*. The word 'crater' means a *large bowl.*

Clouds of steam, and showers of stones and ashes, and streams of melted rock called *lava*, are sometimes poured from these openings. The lava soon cools and becomes hard stone.

The stones and ashes which are thrown out are piled up round the *crater*, and in this way great volcanic mountains have been formed.

Some volcanoes which once sent forth stones and lava, have long since ceased to do so. Such volcanoes are said to be *extinct.* The rain, the wind, and the frost have cracked and broken down their edges, the hollow craters are partly filled up, and grass grows on their sides. But any one who has seen an active volcano will know from the shape of these broken-down craters that they were once active, though they have now been quiet for many years.

EXTINCT CRATERS.

There are a great many volcanoes in the world. Most of them are found in the islands lying on the east and south-east of Asia, and among the mountains which run down the western side of America. In fact, there is almost a chain of volcanoes fringing the eastern, northern, and western shores of *the Pacific* Ocean.

Mount Vesuvius.—But the volcanoes that we know best are in Europe; and the most famous of these is Mount Vesuvius, near the shore of the Bay of Naples in Italy. A cloud seems to rest on the top of Vesuvius even on the clearest day. But it is not, like a common cloud, made of watery vapour from the ocean, but is formed of steam which comes out of the opening in the top of the mountain.

Two thousand years ago Vesuvius was quiet, and had been quite still for so very long a time that people did not know it was a volcano; or, if they did, they thought it was quite extinct. They had built fine houses, and planted vines and olives on the sides of the mountain; and its wide crater was overgrown with trees and brushwood and wild vine. At the foot of the mountain and by the sea-shore were many towns and villages; and the people lived happy, careless lives, and feared no ill from Vesuvius.

But one day, in the year 63, they heard strange noises underground; the earth suddenly began to shake and rock beneath their feet; many houses and temples were thrown down, or greatly injured; and no doubt many persons were killed. During the next sixteen years there was little peace near Vesuvius; shocks were frequent, and the people must have lived in constant dread of some new trouble.

LESSON XXVIII.

MOUNT VESUVIUS (*continued*).

Au-gust
a-larm
vi-o-lent
flash-es
rushed
cin-ders
light-ning
an-i-mal
pil-low
pro-tect
build-ings
dark-ness
mid-night
fish-er-men
beau-ti-ful
bu-ri-ed
e-rup-tion
poured
dread-ful
un-a-ble
es-cape
quar-ter
fif-teen
gar-den

During the month of August in the year 79, the people were kept in almost constant alarm. Shocks were frequent and violent, and a dense cloud of vapour rose upwards from the top of Vesuvius, and then spread out sideways, so that it looked like a huge pine-tree. Every now and then flashes of fire shot out like lightning, and, for a moment, lit up the black cloud; and then all was dark again.

MOUNT VESUVIUS.

Showers of rain, and ashes, and dust began to fall, and the sky was dark at midday. The ground rocked, and the water of the sea rushed off the shore, leaving sea animals and boats on the dry sand.

Cinders and stones now fell with the rain and ashes, and there was no safety either in the houses or in the streets. The people tied pillows and chairs on their heads to protect them from the storm of falling stones, and fled,—some to the shore, and some to open country. A few were killed by the stones, or by the bad air that came from the volcano; and some were crushed by falling buildings.

The cloud, which was first seen high up above the mountain, spread out till it covered land and sea with darkness blacker than midnight.

When at last, after eight days of storm and darkness, the air became a little clear, and the sun shone dimly out, the ground was covered over with white ashes as with a deep snow. Part of the Bay of Naples was filled up with stones and ashes, so that fishermen's huts, which had been on the shore, were now a mile away from it.

And where were the gay cities, and the fine houses, and the beautiful gardens? Many of them were gone—buried deep down under mud, and ashes, and cinders—and no one saw them again for seventeen hundred years. Then men dug through the ashes, and cleared out some of the streets and houses. They found the bodies of some persons who had been killed by the eruption; but it was plain that most of the people had fled from the cities when the ashes and stones began to fall on them.

We said before, that volcanoes often send out melted rock called lava. No lava came from Vesuvius in that dreadful year 79. But there have been a number of eruptions since, during which lava has poured down the mountain sides, and burnt up everything in its way.

In the year 1631 seven streams of lava poured out at one time, and 18,000 persons were unable to escape from it and were killed. In 1779 Vesuvius threw up glowing matter to a height of two miles; and in 1794 the side of the mountain opened, and a stream of lava, a quarter of a mile broad and fifteen feet deep, ran down into the sea.

These must have been grand sights to see; but we may well be glad that we have no such sights in England.

LESSON XXIX.

THE INTERIOR OF THE EARTH.

in-te-ri-or
fount
foun-tain
scratch
boil-ing
height
some-where
deep-er
tem-pe-ra-ture
in-crease
read-ing
wrong

We now know something about the outer crust of the earth. Can we learn anything about the inside, far below all this of which we have been reading?

Yes; but not very much; for we cannot get deep down into the inside of the earth.

The deepest mines in the world are not a mile deep, and a hole one mile deep in the earth would be only like the smallest scratch upon our school globe. We should not learn much about the inside of that globe by making a small scratch upon its surface. So the deepest mine shows us very little of the inside of the earth.

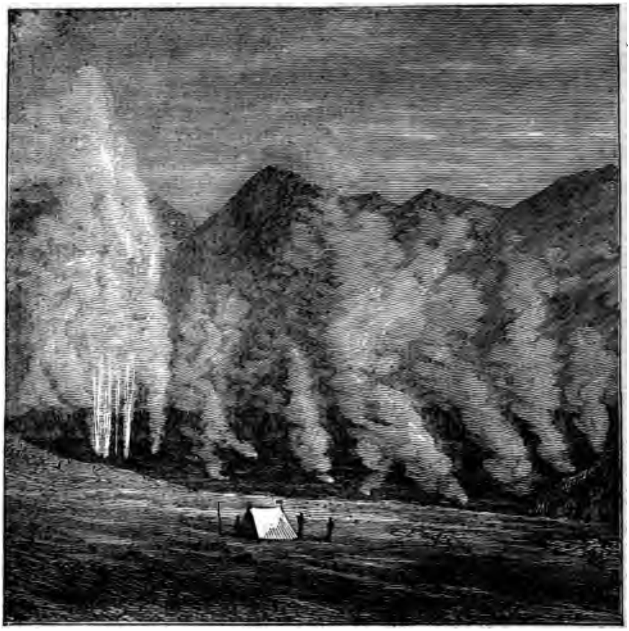
But there are two or three ways in which we can learn something about it.

What Volcanoes Teach.—We have before read about volcanoes. We cannot, of course, get to the bottom of a volcano; but we learn from the streams of lava which are poured out of it, that somewhere within the earth the heat must be very great: great enough to melt any rock.

Increase of Temperature in Mines.—But volcanoes are not the only proof we have of the great heat of the inside of the earth. Even in mines, though none of them are very deep, we find that the further down we go into the earth, the warmer it is. From this it has been thought, that, deeper and deeper, it becomes hotter and hotter; until, at about thirty miles below the surface, the heat would melt iron.

Hot Springs.—Again, in many parts of the world there are springs of water which are quite hot; and in some places there are fountains which throw up boiling water to a great height above the ground. The inside of the earth, near these springs and fountains, must then be hot enough to make water boil.

We cannot be sure that the inside of the earth is full of melted matter, as many people have thought. But we shall not be wrong in saying, that there are some places in it, where the heat is great enough to boil water and to melt rocks.



HOT-WATER FOUNTAINS IN ICELAND.

LESSON XXX.

EARTHQUAKES.

earth-quake
trem-ble
lev-el
ef-fects
se-vere
hol-low
mass-es
sur-face
vil-lage
val-leys
sev-e-ral
car-ried

We do not know what it is which melts the lava that pours out of the volcanoes. But it is clear that there is something going on in the earth which not only causes this, but which sometimes makes the ground tremble, or quake. This quaking is felt from time to time in many parts of the world, and is called an *earthquake*.

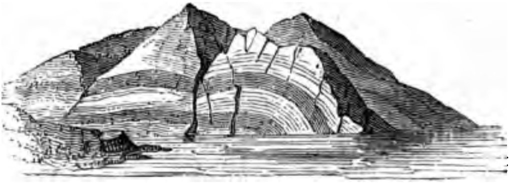
Effects of Earthquakes upon the Land.—When earthquakes are very severe they do much damage—shaking down houses, and killing the people in them. Earthquakes also cause great changes in the surface of the land. Large masses of earth and rock are often shaken down from the mountains, and fill up the beds of rivers. In this way floods are caused and lakes are formed, which alter very greatly the surface of the country. Some earthquakes make cracks in the ground, some of which close up again. Many cracks, however, never close up, but are worn into valleys by the streams which find their way along their bottoms.

In some countries large tracts of land have sunk, and the hollows have become lakes. In other places the ground has been raised up several feet above its former level. Sometimes, too, small islands have sunk below the sea during an earthquake; and at other times part of the ocean bed has been lifted up above the water, and formed into new islands.

Effects upon the Sea.—Sometimes earthquakes have taken place under the sea, and then huge waves sweep over the shores, often far inland. Towns and villages, and even large masses of land, have thus been swept away; and many persons have been drowned.

Origin of Mountains.—Some mountains have been formed by the action of running water, which has scooped out and carried away the softer parts of the rocks. But in most cases the land has been lifted up in one place and has sunk down in another, partly by slow movements, and partly by sudden *shocks*. Yet in all cases the present shapes of hills and valleys are largely due to the action of frost, and wind, and water.

In many places, rocks which were once in flat layers are now found curved and twisted, or standing on end; and here and there great cracks run through them, so that water can pass deep down into the ground.



BENT BEDS OF ROCK.

LESSON XXXI.

THE EARTHQUAKE OF LISBON.

Lis-bon
bright
calm
peo-ple
church-es
ru-ins
fol-lowed
build-ing
steal-ing
starve
starv-ing
a-fraid
shel-ter
built
At-lan-tic
suf-fered

We are now going to read the story of the earthquake of Lisbon. This will teach us how very great the forces must be which are at work within the earth.

The great earthquake of Lisbon took place on the 1st of November, 1755. The morning was bright and calm, and the churches were filled with people. First, a sound like thunder was heard coming from the ground; and then all was still. But it was only for a moment. The solid earth began to rock up and down in waves like those of the sea. The spires of the churches rocked to and fro until they fell. The walls of churches and houses cracked and fell in ruins, and thousands of persons were killed. Clouds of dust filled the air and made the sun dark; and on every side the cries of the wounded were heard. One shock followed another, until nearly every building was in ruins.

To escape from the falling houses, the people rushed down to the shore. But it was no safer for them there. A huge wave came rolling in, driving boats and ships high up on the shore, and sweeping off the crowds of people who had come there.

But this was not all. Fires broke out in many places and lasted for four days; and the people were left without shelter and

EARTHQUAKE AT LISBON.

almost without food. Wicked men went about stealing all they could find. So scarce did bread become, that a small loaf was worth from five to six pounds.

Kind persons did their best to find food and shelter for the starving people; but, for a long time, most of the people lived in tents, and had nothing but hay or straw to sleep upon.

For nearly a month after the first shock, other shocks were felt; and the people were afraid to enter the city. At last, as no more earthquakes were felt, they set to work, and in ten years built the new city of Lisbon.

This earthquake killed about 60,000 persons in Lisbon. It was felt over a large part of Europe, and even in England, and in many parts of America; but no other place suffered so much as Lisbon did.

LESSON XXXII.

THE DIVISIONS OF LAND AND WATER.

east-ern
west-ern
west-ward
north-ern
hem-i-sphere
e-qua-tor
his-to-ry
di-vi-sion
be-cause
half
halves
joined

WE have before read that only about one quarter of the earth's surface is dry land.

Two great divisions of Land and of Water.—Now the land is not all joined together, but is broken by oceans and seas into many pieces of every size and shape. Still, when we look at the map, or at the globe, we see that by far the larger part of the dry land is in two great masses.

Between these masses of land lie two oceans, called the *Atlantic Ocean* and the *Pacific Ocean*. A man may travel from one end to the other of either of the two great divisions of land without crossing the sea. But no one can get from one division to the other, without crossing some part of the Atlantic or of the Pacific Ocean.

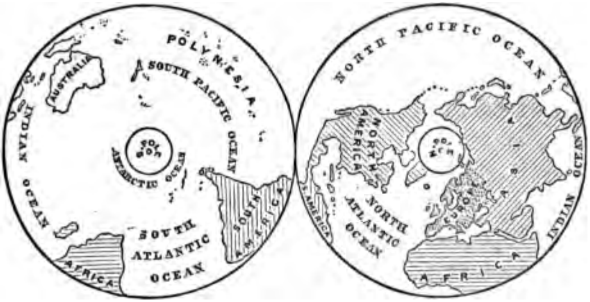
Hemispheres.—If we divide the globe into halves by a line drawn through the

North and South Poles, and passing on one side through the Pacific Ocean, and on the other side through the Atlantic Ocean, each half will contain one of these divisions of land. You know that the earth is sometimes called a sphere, because it is round, like a ball. So, when we divide the globe into halves, we call each a *hemi-sphere*, that is, half a sphere. Living where we do, we have to sail westward if we wish to go to America; so we call that hemisphere in which America is, the *Western Hemisphere*. The other hemisphere, being for the most part east of where we live, is called the *Eastern Hemisphere*.

The Old and the New World.—We know a great deal about the history of the countries in the Eastern Hemisphere for many ages back, and we and our fathers have always lived in it. But America was not known to our fathers until about four hundred years ago. So it is called the *New World*. By the New World, then, we mean the countries in the Western Hemisphere. The countries in the Eastern Hemisphere make up what is called the *Old World*.

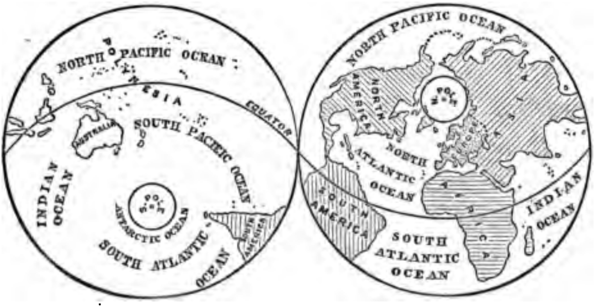
The line which we called the *Equator*

also divides the globe into halves, called the Northern Hemisphere and the Southern Hemisphere.



NORTHERN AND SOUTHERN HEMISPHERES.

If we divide the world into halves, so that England is in the middle of one half, then we have what are called *Land and Water Hemispheres*; because then, one hemisphere is made up mainly of land, and the other mainly of water.



LAND AND WATER HEMISPHERES.

LESSON XXXIII.

THE CONTINENTS.

isth-mus
Af-ri-ca
Pan-a-ma
con-ti-nent
Aus-tra-li-a
cli-mate
our-selves
coast-line
re-sult
moist-ure
in-te-ri-or
des′-erts

Europe, Asia, and Africa.—When we look closely at the two great masses of land, we see that each is made up of two smaller masses, which are joined together by a narrow neck, called an *isthmus*. Thus the Old World is made up of two parts, one of which is called *Europe* and *Asia*, and the other *Africa*. The Isthmus of Suez joins Africa to Asia. Europe and Asia are closely joined, and form one mass.

North and South America.—The two divisions of the New World are called North America and South America. They are joined by a narrow strip of land, which is called the Isthmus of Panama.

Each of these large divisions of land—Europe, Asia, Africa, North America, and South America—is called a *continent*.

Australia.—Besides these five continents there are a great many pieces of land of all sizes, which are not joined to the continents, but have water all round them. They are called *islands*. *Australia*, one of these, is so large that it is often spoken of as the sixth continent.

Climate of America.—There are one or two things we should notice in the shapes of the continents. The Old World is longest from east to west: the New World is longest from north to south. The northern shores of North America are covered with snow which never melts, so that men can hardly live there. As we travel from north to south, we pass from all this ice and snow, first to warm countries, and then to very hot ones. Still going further south, we find ourselves again in cold countries. Now many of the plants and animals in cold countries are quite unlike those in warm or hot countries. So we find in America a great many kinds of both plants and animals, some of which can live only where the weather is always warm, while others can live only where it is cold.

The Coast-line of the Continents.—Notice next, that Africa, South America, and Australia, have very even coast-lines. But the coast-line of Asia and North America is much broken, and that of Europe is still more so. The result is that in Europe and in North America there is hardly any place which is very far from the sea.

Asia is much the largest continent, and some parts of it, as well as of South America, Africa, and Australia, are a long way from the sea. Hence the winds part with their moisture, and become quite dry, before they reach the interior parts of these continents. For this reason we find in them tracts of land which are very dry, and on some of which nothing can grow. These are called *deserts.*

LESSON XXXIV.

THE OCEANS OF THE WORLD.

rea-son
ob-liged
Arc-tic
Ant-arc-tic
In-di-an
di-rec-tion
pas-sage
be-yond
rough
peace-ful
ac-count
voy-age
dif-fi-cult
dan-ger-ous
passed

THE oceans are not quite divided from each other like the masses of land. For this reason we can travel by water from one shore to any other, without being obliged to go across any land. Still, the oceans are to some extent divided by the masses of land, and each of the divisions has its own name.

The Five Oceans.—The *Atlantic Ocean* lies between Europe and Africa on one side and America on the other. The *Pacific Ocean* is between America and Asia. The waters about the North Pole are called the *Arctic Ocean,* and those about the South Pole are called the *Antarctic Ocean.* To these we must add the *Indian Ocean,* which washes the southern shore of Asia and the

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we should at length reach England after a voyage round the world.

During our voyage we missed the Arctic and Antarctic Oceans. All the year round the greater part of them is covered with ice. It is not easy, therefore, to go from the Atlantic to the Pacific Ocean round the northern shore of America. Quite lately a ship has passed from Europe right round the northern shore of Asia; but this, too, is a difficult and dangerous voyage.

LESSON XXXV.

THE USES OF THE OCEANS.

warmed
man-kind
whale
sug-ar
her-ring
liv-er
high-way
prod-ucts
or-ange
pil-chard
Brit-ish
eas-i-er
leath-er
shoes
mac-ke-rel
rais-in
cof-fee
a-broad
our-selves
use-ful

We have now learnt something about the five great divisions into which the waters of the earth are divided,—the Atlantic, Pacific, Arctic, Antarctic, and Indian Oceans. Let us now think what we owe to the oceans.

We have read how the vapour which

rises from the oceans is carried by the winds to the land, upon which it falls as mist or rain. We have also read how, in many cases, hot winds are cooled, and cold winds warmed, by passing over the oceans. We have learnt, too, that countries which are near the sea are not so hot or so cold, as those which are further away from it.

Then we must not forget the herrings, and pilchards, and cod, and mackerel, and other kinds of fish good for food, which are caught in the ocean. Scarcely less useful to mankind are certain sea animals which are not fishes, such as the whale and the seal. Thus, from the fat of the whale, we get oil to burn in our lamps; and from the seal, we get a warm fur to wear in winter time.

THE WHALE.

Oceans are Highways for Ships.—By means of the oceans, ships can sail to and from all parts of the world, and carry to any country the products of every other.

The British Islands in which we live form a very small portion of the land of the world, but they contain a very large number of people. There are far too many persons in England to be fed upon what is grown in England itself. Many of us would starve if

THE BRITISH ISLES.

we could not get food from other countries. This food is brought to us in ships across the oceans. And it is much easier and cheaper to bring it so, than it would be to bring it over land.

The corn and flour from which our bread is made, the leather for our shoes, the cotton for our shirts, the oil for our lamps, the timber for our ships and houses, our sugar, tea, and coffee, our oranges, figs, and raisins, and many other things, are brought to England in ships.

But these ships also carry a great number of persons. Some of these go to sea, because the pure fresh sea air is good for their health. Others go abroad to buy things which will be of use to us at home, or to sell things which have been made in England. And others travel, because they wish to see what other countries and other people are like. When such persons come home again, they often write books about what they have seen; and so we are able to learn almost as much about other parts of the world as if we had been there ourselves.

The oceans, then, are really 'the highways of the world';—that is, they are the great roads along which every one is free to pass when and where he likes.

ON THE HIGHWAY OF THE WORLD.

LESSON XXXVI.

THE OUTLINE OF THE CONTINENTS.

pen-in-su-la	**pro-mon-to-ry**	**Ben-gal**
A-ra-bi-a	**Per-sian**	**Guin-ea**
in-stead	**di-rec-tion**	**strict-ly**

We have before read about the great continents of the world, Europe, Asia, Africa, North America, South America, and Australia. We have also read about the five great oceans—the Atlantic, Pacific, Arctic, Antarctic, and Indian Oceans. Let us now look at the map and notice the shape of these continents, and of the oceans which wash their shores.

The first thing that we notice about the shape of the continents is that three of them, Africa, North America, and South America, are rather alike in shape, being wide in the north and narrow towards the south. Asia and Europe, on the other hand, are wide in the east and grow narrow towards the west. Next, we notice that the great mountain chains of Africa, North America, and South America, run from north to south, while in Europe and Asia they run from east to west.

Each of the continents is longest in the direction of its great mountain range.

And so it is with most of those parts of the continents which jut out into the sea. Each of those that jut out towards the south has a range of mountains which runs along it from north to south. But those that jut out towards the north are mostly low plains without mountains.

Peninsula.—When a piece of land juts out into the sea, so as to have water nearly all round it, we call it a *peninsula*. By a *peninsula* we mean a piece of land which is *almost an island.* Africa, South America, and Arabia, are peninsulas; and many others may be found on the map.

Cape.—Most of the peninsulas end in a point of land called a *cape.* In our voyage round the world we passed the Cape of Good Hope at the south of Africa, and Cape Horn at the south of South America. The word 'cape' means *head. Head, point, bill,* and *naze* or *ness,* are names sometimes used instead of cape. 'Naze' and 'ness' are other forms of the word 'nose.' When a cape is high and rocky, it is often called a *promontory.*

Bay.—Gulf.—Just as there are places where the land juts out into the sea, so there are other places where the sea runs up into the land. Where such a place is wide and open at its mouth, it is called a *bay:* as, the Bay of Bengal. Where it is narrow, and runs some distance into the land, it is called a *gulf:* as, the Persian Gulf. These names are not always used quite strictly, as we see in the case of the Gulf of Guinea, which is more like a bay than a gulf.

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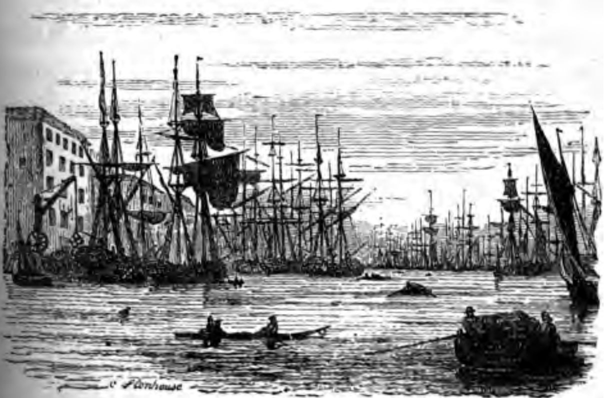
one ag
they bec
we find u

WAVES BE

This goes on
in time the shi
and mud, much

are able to carry cheaply the spare produce of their land and their mills to other countries. These countries send back in return their goods and produce; and thus each country can get what it wants, in return for something which it can spare.

But those people who live far inland very often know nothing about the sea or about other countries; and even if they do, it costs so much to get their produce down to the sea that they can gain but little by it. They have to be content with what they can grow or make for themselves; and they are not so clever, or so rich, as those who



A HARBOUR WITH SHIPPING.

learn what other people can do, and who are able to get the produce of other countries as well as of their own.

An Uneven Coast-line affects the Climate.—The moisture that rises from the sea turns into rain, which waters the land, and makes it more fit for plants. The winds which cross the sea, also serve to prevent the air from being too hot or too cold. Air which is neither very wet, nor very dry, nor very hot, nor very cold, is the best for animals and men, and for those plants which are of use to both. For these reasons a broken coast-line is better for a country than an even coast-line.

Europe has the most Uneven Coast-line.—Now the map shows us that, of all the continents, Europe is the one which has the most uneven coast-line. And we find that Europe is fruitful, and that the people who dwell in it are the most clever, active, and wealthy people in the whole world.

Through a large part of Africa (which has a very even coast-line), the people live far away from the coast, and they know nothing of other countries. They are forced to live upon what they can grow in their own land; and, though they are perhaps happy in their own way, no English boy or girl would care to change places with them.

LESSON XXXVIII.

SUMMARY.

sum-ma-ry
ro-ta-tion
re-vo-lu-tion
e-va-po-ra-tion
con-densed
sea-sons
spring
sum-mer
au-tumn
win-ter
in-te-ri-or
drea-ry
des-ert
earth-quake
vol-ca-no
scoop-ing
wear-ing
moun-tain
de-stroy
un-do-ing
waste

LET us in our last lessons call to mind all that we have been reading about in this book.

Day and Night.—The Seasons.—The Sun.—The earth is nearly round, like a ball. It has two motions, daily rotation and yearly revolution. By rotation we mean that it spins round upon its axis; and by revolution we mean that it travels round the sun. Rotation causes the changes of day and night, and revolution produces the changes of heat and cold which we call the seasons—

that is, spring, summer, autumn, and winter. But we should not have these changes unless the earth's axis were sloped in the way we have read about. Nearly all the light and heat which we enjoy comes from the sun; and nothing could live upon the earth without light and heat.

Water.—Clouds.—Rain.—Moisture.—The surface of the earth is partly water and partly dry land. As the sun's rays fall upon the oceans, lakes, rivers, and moist lands, evaporation takes place. The sun also warms the earth, and the earth warms the air above it. The warm air and the vapour are then pushed aside by cold air; and this causes a wind. When the vapour is in any way chilled, it is condensed, and forms clouds or mist. When a cloud falls to the ground in drops of water, we say it *rains*.

If the air is very cold, the water falls as snow, or sleet, or hail. When moisture falls upon the land, some of it supplies plants and animals with the water which they need; some of it forms lakes and rivers, and runs back into the sea; and some of it sinks deep into the ground, and gives rise to *springs* of fresh clear water. Where no rain or dew falls the land is dry; no plant or animal can live in it, and the dreary waste is called a desert.

Land.—The Earth's Interior.—The forces within the earth are slowly lifting up the land in some places and sinking it in others.

A MOUNTAIN TORRENT.

Sometimes, too, they cause earthquakes and volcanoes, which in a few hours may destroy large cities, raise mountains and islands, or sink them under the sea.

Then on the surface of the earth, heat and cold, and wind and water, are always at work wearing down mountains, filling up old valleys, and scooping out new ones, and in other ways undoing what the forces within the earth are doing.

LESSON XXXIX.

SUMMARY (*continued*).

be-hind
de-pos-it
min-e-rals
pas-sen-gers
fac-to-ries
split-ting
crumb-ling
for-ests
dif-fer-ent
wel-come
con-stant-ly
peb-bles
in-sects
ben-e-fit
ge-og-ra-phy
va-ri-e-ty
tem-pe-rate
Eng-lish-men
com-merce
pro-per-ly
co-lours

The Work of the Rivers.—Of the Oceans.—Down the mountain-sides, and along the valleys, pour the streams and rivers, wearing away rock and soil as they hurry along. Some of this rock and soil they leave on the land; the rest they carry to the sea and deposit upon its bed. Frost and thaw, wind and sunshine, rain and springs, are ever splitting and crumbling the hard rocks. The waves of the ocean are constantly wearing away the rocks and cliffs, and covering the sea-beach with pebbles and sand.

Mountains, valleys, rivers, and seas affect the climate and give to the surface of the earth a variety which is pleasing to the eye.

Varieties of Climate. — Cold. — Temperate. —Hot.—There are lands where snow and ice cover the ground the whole year round, and where neither trees nor grass can grow.

In other lands, such as England, the soil grows many useful plants and trees, which provide food and timber and other things useful to man and beast. And even on the mountain-sides there is soil enough to grow grass, on which very large numbers of sheep are fed. Beneath the surface of the ground, are found coal, and iron ore, and other useful minerals. In these lands the heat is seldom too great, or the cold too severe, for men to work from morning to evening at any kind of trade.

But there are other lands, where the sun's rays are always very hot; where men cannot do much work in the middle of the day; and where Englishmen can hardly live. In these lands large rivers and forests are found, and wild animals and birds and insects of lovely colours abound.

The Use of the Oceans.—And round the shores of all these countries—cold, temperate, and hot—the waters of the ocean are always rising and falling, cooling the hot air in some places, and warming the cold air in others. Across the oceans thousands of ships, laden with goods and passengers, are passing every year between the different countries. And thus almost every part of the world is brought within reach of every other part, to the benefit of all.

Commerce.—The food we eat, the wool and cotton from which our clothes are made, and many other things used in our mills and factories, are brought to us from other lands. In return we send back iron goods, and cloth, and other things which we make.

We welcome people from all parts of the world who come to see what England and the English people are like; and, from those of our own people who have visited other lands, we learn about those lands and about the people who dwell in them. These are some of the things which geography, if we learn it properly, should teach us.

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